Honorable Assistant Commissioner
  for Patents
Washington, D.C.   20231

PTO-FORM 1082
NEW APPLICATION TRANSMITTAL

Dear Sir:

Transmitted herewith for filing is the _X_ utility patent application of Inventors:

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Entitled:

IMAGE FORMING APPARATUS AND TERMINAL DEVICE CONNECTED TO NETWORK

Enclosed are:

1.   **The Papers Required For Filing Date Under 37 C.F.R. § 1.53(b):**

  _23_ Page(s) of Specification
  _6_ Pages of Claims
  _1_ Page of Abstract
  _6_ Sheets of drawings.

2.   ____ **Executed Combined Declaration/Power of Attorney**

3.   **Assignment**

  ____ An Assignment (with Recordation Form Cover Sheet) of the invention to:

4.   **Claim for Priority Under 35 U.S.C. § 120**

  ____ The benefit under 35 U.S.C. § 120 is hereby claimed from the following United States application(s):

5.   **Claim for Priority Under 35 U.S.C. § 119**

  _X_ The benefit of priority under 35 U.S.C. § 119 is hereby claimed from the following foreign application(s):

  (1) Japanese Patent Application No. 9-265620
      Filed: September 30, 1997

    _X_ A Letter submitting a certified copy of the above-identified foreign applications is enclosed.

6. Fee Calculation

CLAIMS AS FILED

	Number Filed	Number Extra	Rate	Basic Fee $ 779.00
Total Claims	20 - 15	0	X $ 22.00	0.00
Independent Claims	6 - 3	3	X $ 82.00	246.00
Multiple dependent claim(s), if any	___	$270.00		0.00

Filing Fee Calculation $ 1,036.00

___ Amendment cancelling extra claims enclosed

___ Amendment deleting multiple dependencies enclosed

7. Small Entity Statement

___ A verified statement that this is a filing by a "small entity" under 37 C.F.R. §§ 1.9 and 1.27 is attached.
Filing Fee Calculation (50% of above) $

8. Fee Payment

___ Not Enclosed

    ___ No filing fee is to be paid at this time.

_X_ Enclosed

    _X_ Filing fee calculation above $ 1,036.00

    ___ Recording assignment
        ($40.00; 37 C.F.R. § 1.21(h)(1)) $ 0.00

        Total fees enclosed $ 1,036.00

9. Method of Payment of Fees

___ Check in the amount of $_____.

_X_ Charge Deposit Account No. 13-0203 in
    the amount of $1,036.00

10. Other Enclosures:

Information Disclosure Statement + five references

11. Authorization to Credit Overpayment or Charge Additional Fees

  X   The Commissioner is hereby authorized to credit any overpayment, or charge fees under 37 C.F.R. § 1.16 (filing fees) or 37 C.F.R. § 1.17 (application processing fees) which may be required, to Deposit Account No. 13-0203. A duplicate copy of this Transmittal Letter is attached for accounting purposes.

12. Conditional Petition For Extensions of Time

  X   Petition is hereby made under 37 C.F.R. § 1.136(a) for any extension of time required to ensure that any papers due in the U.S. Patent and Trademark Office during the pendency of this application are timely filed. Please charge any fees due for any extensions of time to Deposit Account No. 13-0203. A duplicate copy of this Transmittal Letter is attached for accounting purposes.
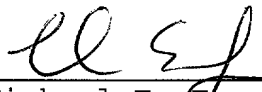
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Respectfully submitted,

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IMAGE FORMING APPARATUS AND TERMINAL DEVICE

CONNECTED TO NETWORK

This application is based on application No. 9-
265620 filed in Japan, the contents of which is hereby
incorporated by reference.

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

The present invention pertains to an image forming
apparatus and a terminal device such as a personal computer
that are connected to a network, and to an image forming system
that incorporates them both.

DESCRIPTION OF THE RELATED ART

In recent years, various types of office machines
have increasingly come to be connected to networks and used
in concert with each other. In particular, when a printer is
connected to a network comprising multiple personal
computers, a printer setup having superior cost performance
can be established due to the fact that multiple users can
jointly use the same printer.

In this type of printer setup, first, the print
request and a sequence of print data are sent from the terminal
device to the printer via the network. The printer receives
these signals, stores the print data temporarily in an image

memory, and then performs printing based on the print data (a printing operation based on a single print request such as described here will be referred to hereinafter as a 'print job').

5   Normally, a relatively inexpensive volatile memory is used for the image memory, and consequently, where the power to the printer goes out due to a sudden failure or some other reason, all of the received print job data is lost, and the print jobs cannot be performed.

10   As a result, up to now it has been necessary for the user to resend the print job data from the terminal device. However, for some users it is extremely inconvenient to resend the data. In addition, where the printer is located far away from the personal computer, the user often does not even know

15   that the power to the printer has failed, and finds out for the first time that his own print job has been lost only after waiting for a period of time and then going to where the printer is located to retrieve it.

          In order to eliminate these problems, a technology has been disclosed in Japanese Laid-Open Patent Application

20   Hei 4-47750, for example, in which the received print job data is backed up in a non-volatile memory in the printer, wherein even if the power fails, the performance of the print job can be continued as soon as power is restored.

25   However, when using the backup method described above, a large-capacity non-volatile memory is necessary in

the printer to store all of the received print job data, which

increases the cost of the printer significantly.

SUMMARY OF THE INVENTION

5   Taking these problems into consideration, the

object of the present invention is to provide an image forming

apparatus and an image forming system in which, even if the

power to the printer is suddenly lost for some reason, the

printer has a resume function whereby it is quickly restored

10   to its state before the power failure occurred and the print

job processing is continued as soon as the power is restored,

while the substantial increase in cost that would be required

to incorporate a large-capacity non-volatile memory is

avoided.

15   In order to achieve this object, the present

invention comprises an image forming apparatus that performs

printing based on data sent from an external terminal device

connected to it via a network, wherein said apparatus has a

non-volatile memory that stores the print job processing

20   status, a determining means that determines, when the image

forming apparatus has been restored to its normal state,

whether there are any jobs remaining to be printed based on

the print job processing status information stored in the

non-volatile memory, and a resend request issuing means that

25   requests a terminal device that sent data of an outstanding

print job to resend the data when it is determined by the determining means that the outstanding print job exists.

In an embodiment of the present invention, one example of the printer returning to its normal state would be when the power is restored after a shutdown. Said embodiment also has a job identification information supply means that provides job identification information to each print job data sent from the external terminal device.

The present invention also comprises a terminal device that sends data to an image forming apparatus connected to it via a network to cause the apparatus to perform printing, wherein said terminal device has a means that receives a data resend request sent from the image forming apparatus when the image forming apparatus has been restored to its normal state, and a data resend means that resends the data in response to the resend request.

The present invention further comprises an image forming system in which an image forming apparatus and a terminal device are connected via a network and the image forming apparatus executes printing based on data sent from the terminal device, wherein said image forming apparatus has a non-volatile memory that stores the print job processing status, a determining means that determines, when the image forming apparatus has been restored to its normal state, whether or not there are any jobs remaining to be printed based on the processing status information stored in the memory,

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and a transmitting means that sends resend request information to request the terminal device that sent the print job data to resend it, and wherein said terminal device has a means that receives data resend request information sent from the image forming apparatus and a data resend means that resends said data in response to the receipt of said resend request information.

The present invention further comprises a print resume method for an image forming apparatus to perform printing based on data sent from an external terminal device connected to it via a network, wherein said method comprises steps in which (1) the print job processing status is stored in a non-volatile memory, (2) it is determined, when the image forming apparatus has been restored to its normal state, whether or not there are any jobs remaining to be printed based on the processing status information stored in the memory, (3) where it is determined by said determining means that there are print jobs remaining to be printed, the terminal device that sent said print job data is requested to resend it, and (4) printing is resumed based on the data sent from the terminal device.

The present invention further comprises a data sending method for the terminal device to send data to the image forming apparatus connected to it via a network and cause it to perform printing, wherein said method comprises steps in which (1) print data is sent to the image forming

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apparatus, (2) a print data resend request sent from the image forming apparatus when the image forming apparatus has been restored to its normal state is received, and (3) the print data is resent in response to said resend request.

5 The present invention further comprises a print data transmission method for an image forming system in which an image forming apparatus and a terminal device are connected via a network, and printing is performed by said image forming apparatus based on print data sent from said terminal device,

10 wherein said method comprises steps in which the image forming apparatus (1) stores the print job processing status in a non-volatile memory, (2) determines, when the image forming apparatus has been restored to its normal state, whether or not there are any jobs remaining to be printed based on the

15 processing status information stored in the memory, and (3) where it is determined that there are print jobs remaining to be printed, sends resend request information requesting that the terminal device that sent said print job data to resend it, and steps in which the terminal device (1) receives

20 the print data resend request information sent from the image forming apparatus and (2) resends the print data in response to the receipt of said resend request information.

These and other objects, advantages and features of the invention will become apparent from the following

25 description thereof taken in conjunction with the

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accompanying drawings which illustrate specific embodiments
of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

5   In the following description, like parts are
designated by like reference numbers throughout the several
drawings.

        Fig. 1 is a drawing showing the entire construction
of a printer pertaining to an embodiment of the present

10   invention.

        Fig. 2 is a drawing showing the entire construction
of a printer system in which said printer and multiple
computers are connected via a network.

        Fig. 3 is a block diagram showing the construction

15   of a communication controller located inside said printer.

        Fig. 4 is a drawing showing the communication
sequence between the printer and the computer.

        Fig. 5 is a drawing showing an example of the job
control table prepared on the printer side.

20   Fig. 6 is a flow chart showing the printer processes
performed after power is restored.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

        An embodiment of the image forming apparatus
pertaining to the present invention will now be explained

25   using the example of a printer.

Fig. 1 is a drawing showing the entire construction

of said printer 1. As shown in the drawing, the printer 1 has

a communication controller 10, a print controller 30, a

printer unit 50, a paper supply unit 70 and a paper re-supply

5   unit 90.

The communication controller 10 controls the

communication of signals sent to and from the external devices

via the network and sends the received print data to the print

controller 30 after developing a bitmap image if necessary.

10   The print data may be either code data or the image data

itself.

The print controller 30 outputs exposure control

signals based on the image data received by the communication

controller 10 or the image data received and bitmapped by the

15   communication controller 10, and performs control of the

printer unit 50, paper supply unit 70, paper re-supply unit

90, etc., to cause them to perform an image forming operation

in a smooth fashion.

The printer unit 50 reproduces the image on a sheet

20   of recording paper using the public-domain

electrophotographic method, and a laser diode 51 performs

laser irradiation by means of a light-modulated laser beam

based on exposure control signals output from the print

controller 30. This laser beam is reflected off the mirror

25   surface of a polygon mirror 52 that rotates at a prescribed

angular speed, and irradiates the surface of a photoreceptor drum 56 via an f(lens 53 and mirrors 54a, 54b and 55.

Prior to receiving exposure by the laser beam, any remaining toner on the photoreceptor surface is cleaned by

5   means of a cleaning member 57, and after any charge present is eliminated by means of an eraser lamp not shown in the drawings, the photoreceptor drum 56 is uniformly charged by means of a charger 58. When it is then exposed by said laser beam, an electrostatic latent image is formed. This

10   electrostatic latent image receives toner from a developing device 59 and is developed into a toner image.

The paper supply unit 70 supplies sheets of recording paper of prescribed sizes to the printer unit 50, and includes two paper cassettes 71 and 72. The size of the

15   sheets of paper stacked in these cassettes is detected by paper size sensors SE1 and SE2 using the photoelectric method, for example, and a paper cassette is selected by the print controller 30 based on the detection signals from the sensors SE1 and SE2. A sheet of recording paper of the required size

20   is supplied synchronously with the image formation on the photoreceptor drum 56, and the toner image on the surface of the photoreceptor drum 56 is transferred to the surface of the recording paper at the transfer position underneath the photoreceptor drum 56 by means of an electrostatic charge from

25   a transfer charger 60.

The recording paper is then separated from the surface of the photoreceptor drum 56 by a separator charger 61 and is conveyed to a fuser unit 63 by a conveyor belt 62, and the image is then fused onto the recording paper by means of the application of pressure and heat by a fuser roller 64 equipped with an internal heater.

After fusing, the recording paper is ejected onto a paper eject tray 92 via a conveyance path 91 located in the paper re-supply unit 90.

Where an image is to be reproduced on the back side of the sheet of recording paper as well (two-sided printing), the paper re-supply unit 90 flips the sheet of recording paper regarding which image formation was already performed on the front side onto its back side and re-supplies it to the transfer position. Where two-sided printing is to be performed, it enables printing onto the back side of the recording paper by causing the left tip of a switching claw 93 of the paper re-supply unit 90 to face upward, guiding the recording paper into the conveyance path 94, feeding the paper forward in the direction of a flipping conveyance path 96 by means of a flipping roller 95, and then causing the flipping roller 95 to rotate backward to send the paper to the transfer position underneath the photoreceptor drum 56 via the conveyance path 97.

Sensors SE3 through SE6 are jam detection sensors comprising photoelectric detectors using the reflection

method that are equipped with, for example, light-emitting elements and photoelectric conversion elements. These sensors detect the conveyed recording paper, and where the trailing edge of the recording paper is not detected within

5   a prescribed period of time after the leading edge of the paper is detected, the print controller 30 determines that a paper jam has occurred.

Fig. 2 is a drawing showing an example of the construction of a printer system in which the printer

10   described above is connected to personal computers (hereinafter simply 'computers') via a network.

As shown in the drawing, two printers 1A and 1B are connected to multiple computers 2A through 2N, which operate as terminal devices, via a LAN (local area network) in this

15   printer system. By designating a printer and sending a print request and image data from one of the computers via the LAN, a printing operation is performed by the designated printer. Here, any type of LAN configuration is acceptable, such as the public-domain Ethernet or Token Ring constructions.

20   Each computer 2A through 2N comprises a general-purpose computer equipped with a display, a CPU, input devices (a keyboard and a mouse), external storage devices (a hard disk drive and a floppy disk drive), etc., and incorporates a LAN interface. It also has LAN connection

25   application software installed on it.

Fig. 3 is a block diagram showing the construction

of the communication controller 10 in each printer 1A and 1B.

The communication controller 10 comprises a LAN

interface 101, a CPU 102, a ROM 103, a volatile RAM 104, a

5   non-volatile RAM 105 and an I/O port 106 which are connected

to one another via a data bus 107.

Programs necessary for the control of network

communications, and data and programs for bitmapping where

the received print data comprises a sequence code such as a

10   page description language (PDL), are stored in the ROM 103.

The volatile RAM 104 temporarily stores image data

and control variables in memory. Where the print data received

from the computer comprises a sequence code, the print data

is stored in the volatile RAM 104 after it is bitmapped by

15   the CPU 102 based on programs resident in the ROM 103. Where

the received print data comprises already bitmapped data

(image data), it is stored in the volatile RAM 104 as is. This

volatile RAM 104 can accept as many print requests from the

computers 2A through 2B as free memory exists to handle them.

20   The non-volatile RAM 105 stores the identifier for

the device that issued the print request and the job number

in the job control table stored in said RAM, while associating

them with each other.

When printing is underway, the image data stored

25   in the volatile RAM 104 is read out in sequence and sent to

the print controller 30 via the I/O port 106. The print

controller 30 performs printing based on this image data.

Fig. 4 is a drawing showing the communication

sequence where handshaking between the computer 2A and the

5   printer 1A is performed and the print job is then executed.

This example explains the case in which bitmapped image data

is transmitted from the computer 2A. First, the user sends

a print request packet from the computer 2A to the network

(①). Here, a 'packet' refers to data transmitted in

10   accordance with a LAN communications protocol, and a 'print

request packet' includes information (hereinafter simply the

'packet type') indicating the type of packet (In step ①, the

print request), an identifier indicating the device that

issued the request (the requesting device identifier) and an

15   identifier indicating the device to which the request was

issued (the requested device identifier).

The requesting device identifier and requested

device identifier are identifiers that were previously

allocated when each device was connected to the LAN. Any

20   identifier that enables proper identification of each

computer and printer is acceptable. In this embodiment, for

ease of comprehension the identifiers used to designate the

printers 1A and 1B and the computers 2A through 2N will be

the same designations used herein, i.e., '1A', '1B', and '2A'

25   through '2N'.

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The requesting device identifier and requested device identifier consist of information that is normally included in each packet that is sent according to the LAN communications protocol in order to specify the device to

5   which the communication is transmitted.

When the communication controller 10 of the printer 1A receives the print request packet from the computer 2A, first, it confirms that the requested device identifier included in the packet is its own identifier (1A), and then

10   accepts the print request. After it accepts the print request, it assigns a job number that has not previously been used in association with the requesting device identifier 2A, using the job control table stored in the non-volatile RAM 105, and then registers the requesting device identifier 2A together

15   with the associated job number in the job control table.

Fig. 5 is a drawing showing one example of the construction of said job control table.

Requesting device identifiers included in the received print request packets are registered in the leftmost

20   requesting device identifier column, and where multiple print jobs are requested from the computer having the same requesting device identifier, the job numbers used to differentiate among said print jobs are allocated in sequence for each requesting device identifier, beginning with '0'.

25   For example, when the registration of print jobs has been completed up to the row (3) in the drawing, if a print

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request packet is received from the computer 2A, the

requesting device identifier '2A' is registered in the

requesting device identifier column for the row (4), and a

job number for that print job is set. Because the job numbers

5   '0' and '1' are already allocated to requesting device

identifier 2A, the job number '2' is allocated and registered

in the job number column.

A job number allocated in this way in response to

a print request from a different computer is sent to the

10   computer 2A via the network in a 'job response packet'

together with the packet type indicating that it comprises

a response to a job request and information on the requested

device identifier '1A' and requesting device identifier '2A'

(②).

15   The computer 2A confirms that the requesting device

identifier included in the received packet is '2A', and then

accepts the packet. When it determines that the packet is a

job response packet based on the packet type, the computer

2A associates the job number given in the packet with the file

20   name or the image memory address for the job (image data)

sought to be printed and stores them in an image data control

table (not shown in the drawings) in the internal RAM.

The computer 2A then sends a packet, which includes

the job number and the image data corresponding to this job

25   number, the requesting device identifier, the requested

device identifier, and the packet type indicating that image

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data is being transmitted, as an image transmission packet (③). When sending of the image data is completed, the computer 2A sends a packet including the packet type indicating that the image data was sent, as well as the requested device

5   identifier and the requesting device identifier, as an image transmission completion packet (④).

On the other hand, the printer 1A receives said image transmission packet and image transmission completion packet, and then (i) stores the transmitted image data in the

10 non-volatile RAM 104, (ii) associates it with its job number, and (iii) stores the storage address for the image data in the volatile RAM 104 and the amount (size) of said image data in the image address column and the image size column, respectively, of the job control table. If the image data is

15 not to be stored in the volatile RAM 104, 'none' is registered in the image address column and the image size column.

The print controller 30 controls the printer unit 50, paper supply unit 70 and paper re-supply unit 90 so that print jobs are executed in the order in which they were stored

20 in the job control table. The communications controller 10 clears the job control table registration contents and the image data stored in the volatile RAM 104 for each print job as it is completed.

Where the power to the printer 1A is terminated by

25 mistake while a print job is being processed, the non-printed

image data stored in the volatile RAM 104 is lost. This kind of unexpected situation can occur due to, for example, (i) another user mistakenly turning the power switch to the printer to the OFF position, or kicking the power cord to the printer and unplugging it from the power outlet, or (ii) the circuit breaker governing the power outlet being used by the printer being tripped due to overloading.

Even if the problem is resolved and power to the printer is restored, however, because the image data is lost and print jobs cannot be executed without it, the present embodiment performs the following processes.

First, when the power is restored by turning the power switch ON, etc., after power was lost, where the computer 2A determines that a non-printed job exists by referring to the job control table in the non-volatile RAM 105, it generates an image transmission request packet and sends it via the network to the computer that sent the original job request so that it will send the image data again, while designating a job number (⑤).

For example, in the job control table shown in Fig. 5, where the power is lost after the job processing for job (3), i.e., the job having job number '0' for the computer 2B is completed, the job having the job number '2' for the computer 2A and the job having the job number '1' for the computer 2B are remaining in the job control table as unprocessed jobs. When this occurs, the printer 1A sends to

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the computer 2A via the network an image transmission request

packet requesting that it send the image data for the job

number '2', and sends to the computer 2B via the network an

image transmission request packet requesting that it send the

5   image data for the job number '1'.

When receiving this image transmission request

packet, the computer 2A reads out from its own image memory

the image data associated with the designated job number, by

referring to the image data control table, and sends it as

10   an image transmission packet (⑥). When sending of the image

data is completed, it sends an image transmission completion

packet indicating that transmission was completed (⑦).

Upon receiving the resent image data, the printer

1A resumes processing of the print job.

15   Fig. 6 is a flow chart showing the control of the

printer 1A when the power is restored to the printer after

it was terminated.

When the power is restored, first, the CPU 102

initializes the control variables and flags in the volatile

20   RAM 104 and the I/O port 106 (step S1), and then determines

with reference to the job control table in the non-volatile

RAM 105 whether or not any unprocessed print jobs exist (step

S2).

If there is a remaining unprocessed print job, it

25   clears the image address and the image size stored in the job

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control table for that print job (step S3) because it would be meaningless to keep them any longer when the pertinent image data has been lost from the volatile RAM 104. The image address and image size will be updated when the image data

5   for this job is resent.

The CPU 102 generates an image transmission request packet that includes the identifiers for the computer requesting the print job (2A) and the printer itself (1A), as well as an image transmission request, and sends it via

10   the network (step S4), whereupon the CPU 102 returns to the main routine (not shown in the drawings) to perform control of the operation of the entire printer, and then waits for the resending of the image data from the computer 2A in order to resume the print job.

15   By having this type of resume function, if power to the printer is terminated for some reason and the image data received and stored in the volatile RAM 104 is lost, the situation before the power was lost can be restored quickly and processing of the print job can be resumed by having the

20   printer refer to the job control table stored in the non-volatile RAM 105, request that the image data be resent, and receive the resulting transmission of said image data.

Furthermore, because the amount of memory necessary for the creation of this job control table is much

25   less than that needed for the storage of image data, the use of relatively expensive non-volatile RAM can be minimized to

the greatest possible extent, reducing the cost of the apparatus while making it possible to perform efficient job processing as described above.

The printer pertaining to this invention was explained based on an embodiment, but the present invention is naturally not limited to this embodiment, and the following variations may be possible. (1) In the above embodiment, a job number is generated by the printer, and the requesting computer is notified of this job number, so that multiple jobs from the same computer may be differentiated from one another. It is also acceptable if this job number information is generated by the computer, sent as print request packet data or as image transmission packet data to the printer and registered in the job control table. In this case, the file name for said image data stored in the computer or other designation may be used for the job number.

(2) The above embodiment discloses a printer system connected by means of a LAN, but it is also acceptable if a wide-area network constructed by means of modems and telephone lines (or wireless circuits) is used in the construction of the printer system.

(3) The above embodiment discloses personal computers as an example of the terminal devices connected to the printers via the network, but a different image information generating device, such as a word processor that can be connected to a network, may be used instead. In

addition, where the printer includes an image data receiving device such as an image reader, the image data or sequence code described above need not be included in the information sent from the terminal device, and said information may

5   comprise control data to indicate the conditions for the image formation regarding the image data obtained by means of the image data receiving device, i.e., the number of copies, information regarding enlargement or reduction, and/or other public-domain print modes.

10   (4) Where a single printer is connected to a single external computer, because the other device may be specified with certainty, notification of the requesting device identifier or requested device identifier need not be performed.

15   (5) The above embodiment was explained with regard to a situation in which the power to the printer was terminated immediately after a print job was finished, but where the power is cut off while print job processing is underway, the printer of this invention may request that the image data for

20   that print job be re-sent from the beginning, or the page numbers for which printing is completed may be monitored and the last completed page number may be stored in the job control table, such that a transmission request packet designating the number of pages of the original document to be printed

25   is subsequently sent to the computer that issued the original job request after the power to the printer is restored.

(6) In addition, the above embodiment was explained using a laser printer as the example of the image forming apparatus, but it is not limited to the use of a laser printer. A printer employing a different type of printing method may be used instead, such as an inkjet printer or a digital copying machine having an image reader that can also perform printing based on externally input image data.

As described above, the present invention comprises an image forming apparatus that receives a print request and image information data from a terminal device connected to it via a network and executes a print job, wherein the print job processing status is stored in a non-volatile memory, and wherein when the power to the printer is restored after being terminated, where print jobs that have not yet been processed are determined to exist after reference to the print job processing status stored in the non-volatile memory, the terminal device that requested said print job is requested to resend the image information data for that print job. Therefore, if the terminal device is constructed such that it receives the resend request and resends the image information data, the image forming apparatus can smoothly execute the non-processed print jobs based on the resent image information data, and its operational efficiency can be dramatically improved by eliminating the inconvenience of requiring the user to go to the trouble of re-sending the image information data.

Furthermore, because the memory capacity required for the non-volatile memory to store the print job processing status is significantly less than the capacity that would be required to back up the image data, the present invention may

5   be realized at a low cost.

Moreover, because the image information data includes information designating the image formation conditions, as well as image data or sequence codes enabling image formation, and image formation using the present

10   invention is performed based on said information and data or codes, various types of print requests from the terminal device may be issued.

Although the present invention has been fully described by way of examples with reference to the

15   accompanying drawings, it is to be noted that various changes and modification will be apparent to those skilled in the art. Therefore, unless otherwise such changes and modifications depart from the scope of the present invention, they should be construed as being included therein.

WHAT IS CLAIMED IS:

1.   An image forming apparatus that performs printing based on data sent from an external terminal device via a network, comprising:

5   a non-volatile memory which stores processing status information of print jobs;

determining means for determining, when the image forming apparatus has been restored to its normal state, whether there are any jobs remaining to be printed based on

10   the print job processing status information stored in the non-volatile memory; and

resend request issuing means for requesting a terminal device that sent data of an outstanding print job to resend the data when it is determined by the determining

15   means that the outstanding print job exists.

2.   An image forming apparatus as claimed in Claim 1, wherein said restoration in the determining means is a power restoration after a shutdown .

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3.   An image forming apparatus as claimed in Claim 1, further comprising:

job identification information supply means for providing job identification information to each print job

25   data sent from the external terminal device.

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4.   An image forming apparatus as claimed in Claim 3,

wherein said resend request issuing means requests

to resend the data based on the job identification information

of the outstanding print job.

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5.   An image forming apparatus as claimed in Claim 3,

wherein said non-volatile memory stores the job

identification information with a terminal device identifier

which send data of the job.

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6.   An image forming apparatus as claimed in Claim 1,

wherein said data includes an information of print

request and a print data.

15   7.   A terminal device that sends data to an image forming

apparatus connected to it via a network to cause the apparatus

to perform printing, comprising:

receiving means for receiving a data resend request

sent from the image forming apparatus when the image forming

20   apparatus has been restored to its normal state; and

data resend means for resending the data in

response to the resend request.

8.   A terminal device as claimed in Claim 7,

25   wherein said receiving means receives a job

identification information with the resend request, and said

25

data resend means resend the data corresponding to the job identification information.

9. An image forming system in which an image forming apparatus and a terminal device are connected via a network and the image forming apparatus executes printing based on data sent from the terminal device, comprising:

said image forming apparatus including,

a non-volatile memory which stores the print job processing status,

determining means for determining, when the image forming apparatus has been restored to its normal state, whether or not there are any jobs remaining to be printed based on the processing status information stored in the memory, and

transmitting means for sending resend request information to request the terminal device that sent the data of an outstanding print job to resend it when it is determined by the determining means that the outstanding print job exists; and

said terminal device including,

receiving means for receiving the resend request information sent from the image forming apparatus, and

data resend means for resending said data in response to the receipt of said resend request information.

10.   An image forming system as claimed in Claim 9,

           wherein said restoration in the determining means

is a power restoration after a shutdown .

5   11.   An image forming system as claimed in Claim 9, said

image forming apparatus further comprising:

           job identification information supply means for

providing job identification information to each print job

data sent from the external terminal device.

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12.   A image forming system as claimed in Claim 11,

           wherein said receiving means receives a job

identification information with the resend request, and said

data resend means resend the data corresponding to the job

15 identification information.

13.   A print resume method for an image forming apparatus

to perform printing based on data sent from an external

terminal device connected to it via a network, comprising the

20 steps of:

           storing the print job processing status in a

non-volatile memory;

           determining, when the image forming apparatus has

been restored to its normal state, whether or not there are

25 any jobs remaining to be printed based on the processing

status information stored in the memory;

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requesting the terminal device that sent said

print job data to resend it when it is determined by said

determining means that there are print jobs remaining to be

printed; and

5   resuming printing based on the resended data sent

from the terminal device.

14.   A data sending method for the terminal device to

send data to the image forming apparatus connected to it via

10   a network and cause it to perform printing, comprising the

steps of:

           sending print data to the image forming apparatus;

           receiving a print data resend request sent from the

image forming apparatus when the image forming apparatus has

15   been restored to its normal state; and

           resending the print data in response to said

resend request.

15.   A print data transmission method for an image forming

20   system in which an image forming apparatus and a terminal

device are connected via a network, and printing is performed

by said image forming apparatus based on print data sent from

said terminal device, comprising the steps of:

           said image forming apparatus including the steps

25   of,

storing the print job processing status in a non-volatile memory,

determining, when the image forming apparatus has been restored to its normal state, whether or not there are

5 any jobs remaining to be printed based on the processing status information stored in the memory, and

sending resend request information requesting that the terminal device that sent said print job data to resend it when it is determined that there are print jobs

10 remaining to be printed; and

said terminal device including the steps of,

receiving the print data resend request information sent from the image forming apparatus, and

resending the print data in response to the

15 receipt of said resend request information.

ABSTRACT OF DISCLOSURE

An image forming apparatus receives a print request and image information data from a terminal device connected to it via a network and executes a print job. The print job processing status is stored in a non-volatile memory. When the power to the printer is restored after being terminated, where print jobs that have not yet been processed are determined to exist after reference to the print job processing status stored in the non-volatile memory. The terminal device that requested said print job is requested to resend the image information data for that print job. Therefore, if the terminal device is constructed such that it receives the resend request and resends the image information data, the image forming apparatus can smoothly execute the non-processed print jobs based on the resent image information data.

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Fig. 1

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54b
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SE3
SE4
SE5
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SE6
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SE1
72
SE2

Fig. 2

Fig. 3

Fig.4

Printer 1A   Computer 2A

Print Request
                    Job Request Packet   ①
                    ◄───
                    (Packet Type, Requested Device Identifier,
                        Requesting Device Identifier)

                    Job Response Packet   ②
                    ───►
                    (Packet Type, Requested Device Identifier,
                    Requesting Device Identifier, JOB Number)

                    Image Transmission Packet   ③
                    ◄───
                    (Packet Type, Requested Device Identifier,
                        Requesting Device Identifier,
                            JOB Number, Image Data)

                    Image Transmission Completion Packet   ④
                    ◄───
                    (Packet Type, Requested Device Identifier,
                        Requesting Device Identifier)

Power OFF ≈   ≈

Power ON
                    Image Transmission Request Packet   ⑤
                    ───►
                    (Packet Type, Requested Device Identifier,
                    Requesting Device Identifier, JOB Number)

                    Image Transmission Packet   ⑥
                    ◄───
                    (Packet Type, Requested Device Identifier,
                        Requesting Device Identifier,
                            JOB Number, Image Data)

                    Image Transmission Completion Packet   ⑦
                    ◄───
                    (Packet Type, Requested Device Identifier,
                        Requesting Device Identifier)
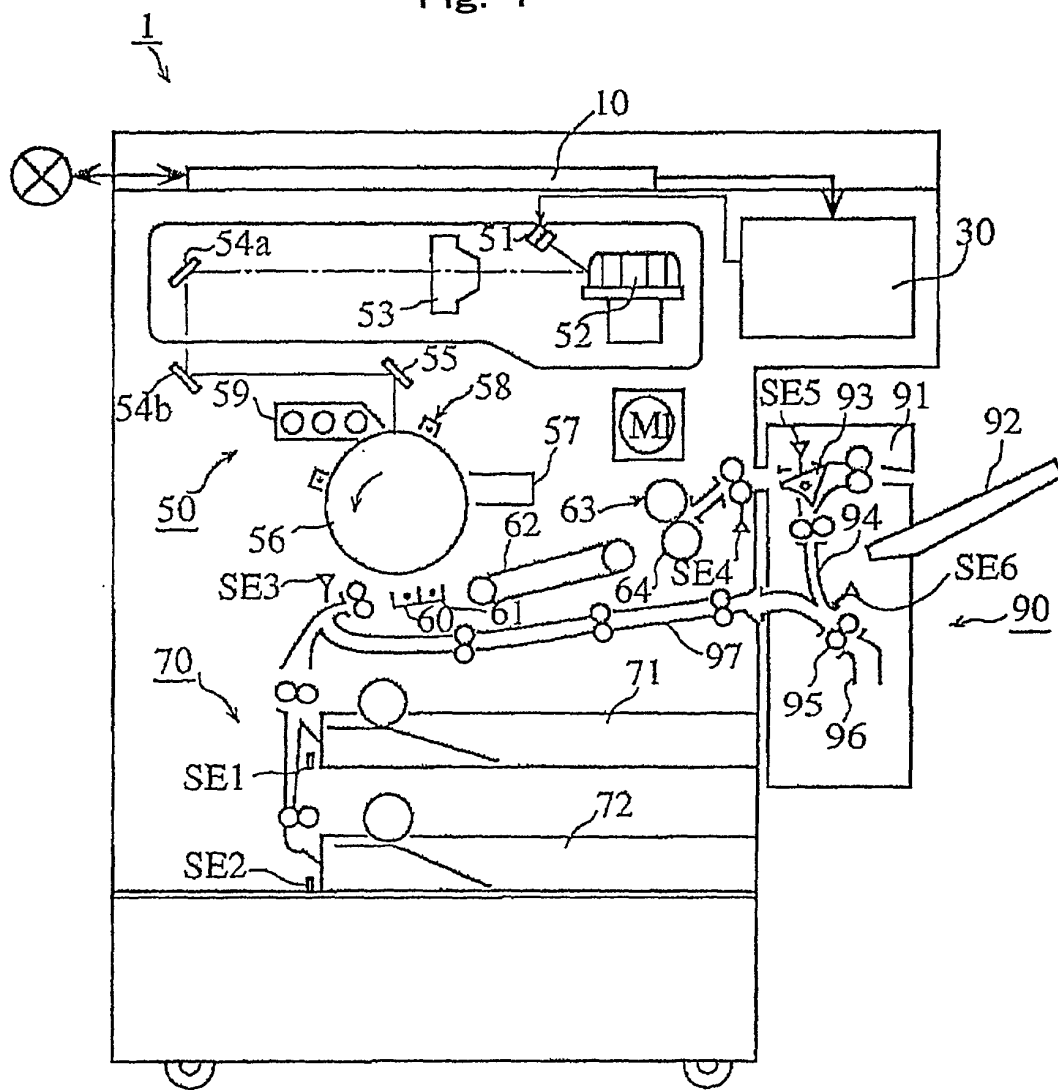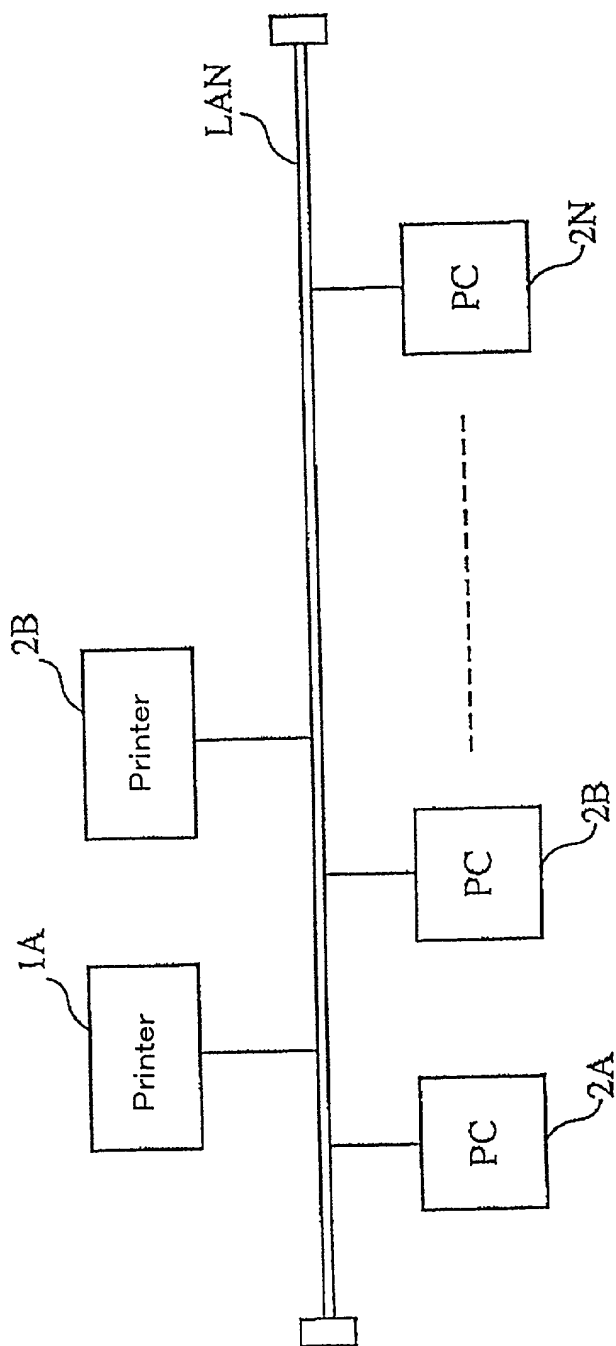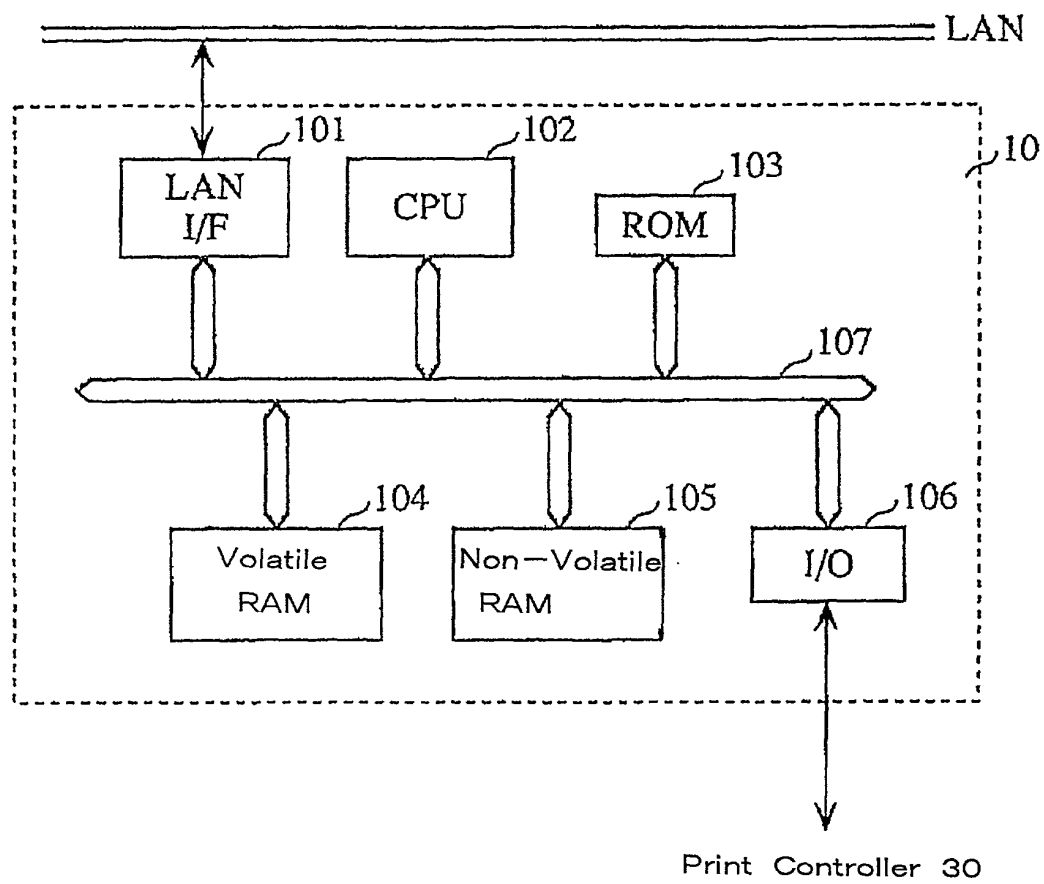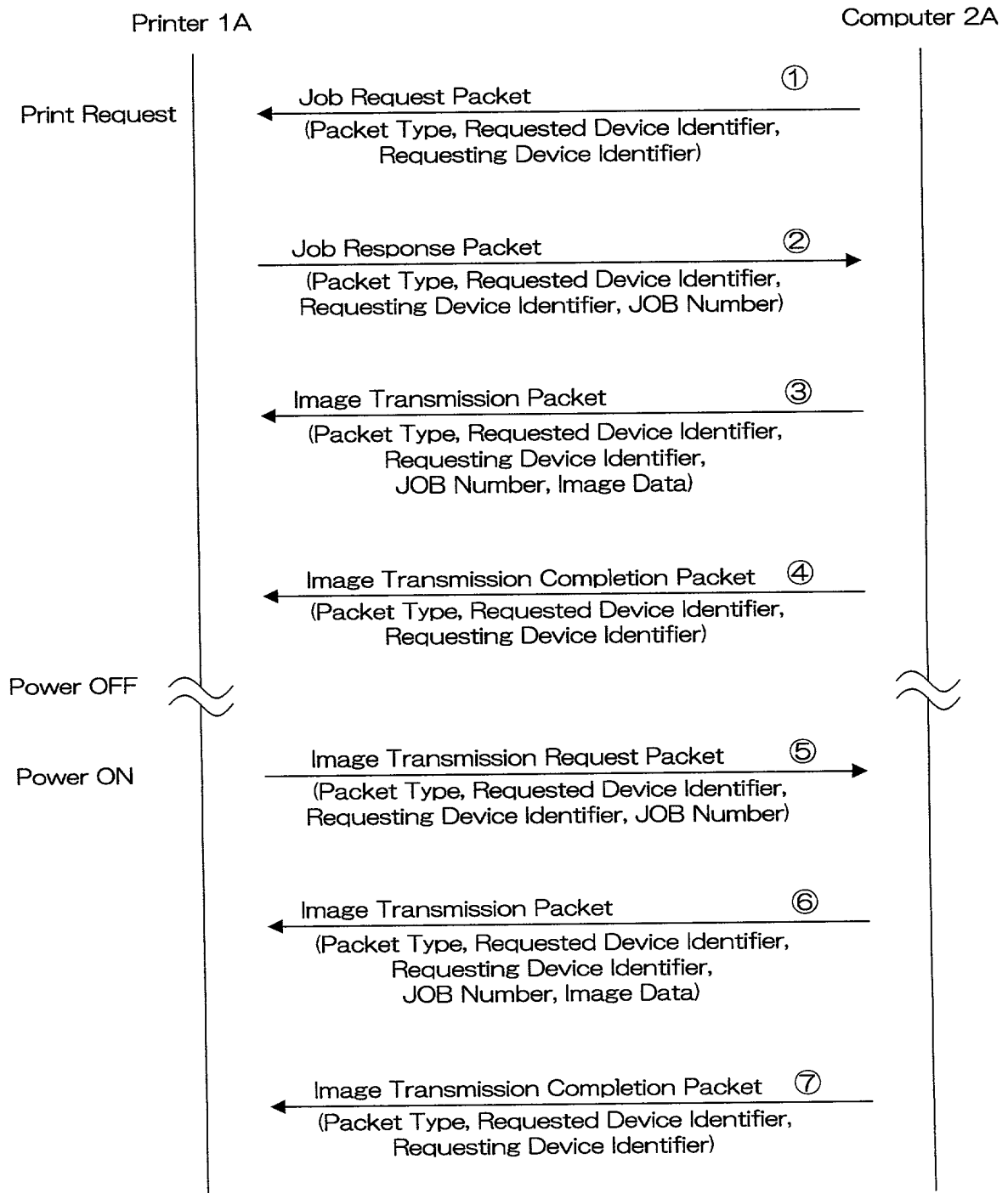
Fig. 5

	Requesting Device Identifier	JOB Number	Image Address	Image Size
(1)	2A	0	1000H	200H
(2)	2A	1	—	—
(3)	2B	0	0H	100H
(4)	2A	2	10000H	500H
(5)	2B	1	500H	100H
	. . . . . .	. . . . . .	. . . . . .	. . . . . .

Fig.6

```
      ┌────────────────────┐
      │  Power ON Process  │
      └────────────────────┘
                │
                ▼
      ┌────────────────────┐  S1
      │   Initialization   │
      └────────────────────┘
                │
                ▼
           ╱────────╲            S2
          ╱ Job exist ╲           N
         ╱  In The Job  ╲──────────┐
         ╲ Control Table?╱         │
          ╲            ╱           │
           ╲────────╱             │
                │ Y                │
                ▼                  │
      ┌────────────────────┐  S3   │
      │ Clear Image Address·│      │
      │     Image Size      │      │
      └────────────────────┘       │
                │                  │
                ▼                  │
      ┌────────────────────┐  S4   │
      │    Send Image       │      │
      │    Transmission     │      │
      │   Request Packet    │      │
      └────────────────────┘       │
                │                  │
                ▼◄─────────────────┘
           ┌──────────┐
           │  Return  │
           └──────────┘
```
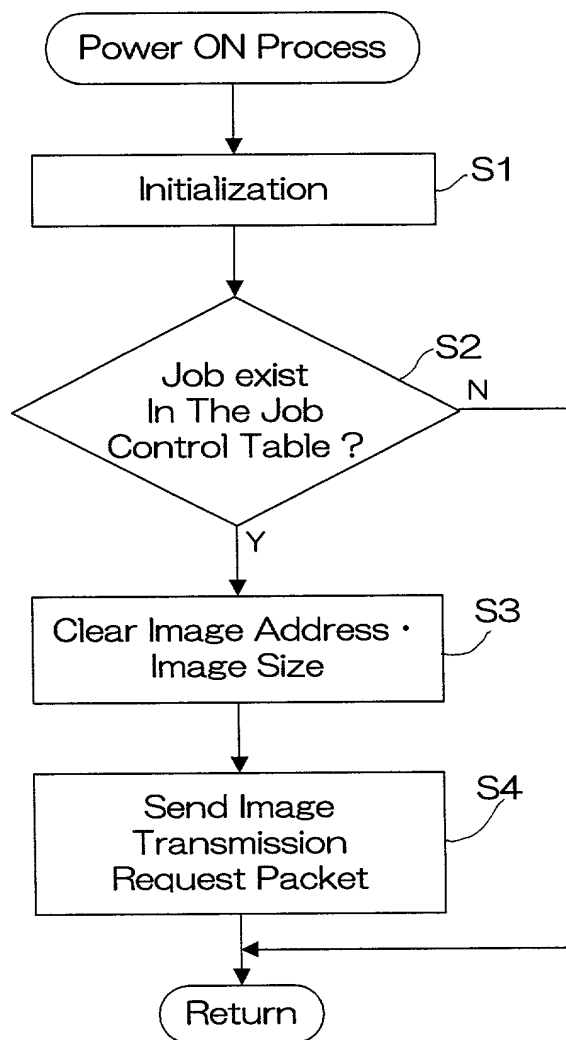
United States Patent & Trademark Office
Office of Initial Patent Examination -- Scanning Division
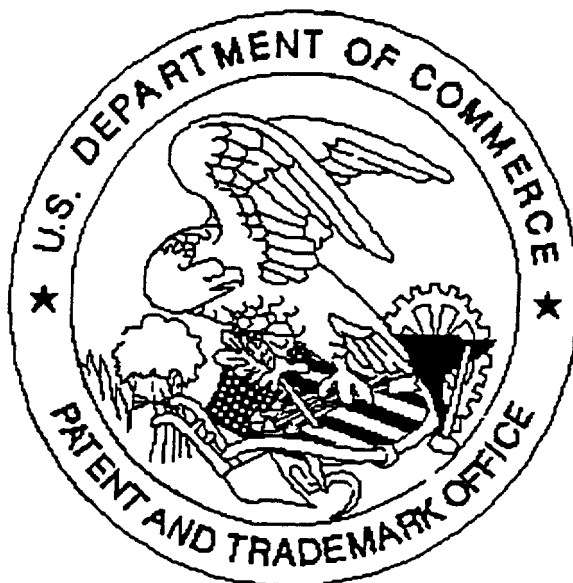
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